

Application No. 09/589,299

Filed: June 7, 2000

TC Art Unit: 2675

Confirmation No.: 9186

THE CLAIMS

1. (Previously Presented) A compact display device for transmitting an image to a user's eye, the display device comprising:

a head-mountable support fixture comprising an elongated member having a first end and a second end;

a projection system including a display operative to provide an image, the projection system attached at the first end of the elongated member of the support fixture; and

an eyepiece assembly attached to the second end of the elongated member of the support fixture, the eyepiece assembly comprising an axial optical system;

wherein the support fixture maintains the projection system and the eyepiece assembly in alignment along an optical path through free space between the projection system and the eyepiece assembly, with the projection system disposed to transmit the image on the optical path and the eyepiece assembly disposed to receive the image from the projection system and to direct the image to the user's eye.

2. (Original) The device of claim 1, wherein the support fixture comprises a post oriented off the optical path.

3. (Original) The device of claim 2, wherein the post is curved.

4. (Original) The device of claim 1, wherein the display comprises a liquid crystal display, an electroluminescent display, a field emission display, or a cathode ray tube.

5. (Original) The device of claim 1, wherein the projection system further comprises an illumination source.

6. (Original) The device of claim 1, wherein the eyepiece assembly comprises a reflecting surface oriented to direct the image to the user's eye and a lens.

Application No. 09/589,299
Filed: June 7, 2000
TC Art Unit: 2675
Confirmation No.: 9186

7. (Original) The device of claim 1, wherein the eyepiece assembly allows passage of ambient light to the user's eye.

8. (Original) The device of claim 1, wherein the eyepiece assembly comprises a polarization beam-splitter coating, a quarterwave plate, and a focusing mirror arranged so that polarized light from the projection system passes the beam-splitter coating and the quarterwave plate and is reflected from the focusing mirror to pass in the opposite direction through the quarterwave plate and is reflected from the beam-splitter coating toward the user's eye.

9. (Original) The device of claim 1, wherein the projection system further comprises a reflecting surface oriented to direct light from the display onto the optical path through free space.

10. (Previously Presented) The device of claim 1, wherein the projection system further comprises a lens oriented to direct light from the display onto the optical path.

11. (Original) The device of claim 1, wherein the projection system is disposed within a housing, and the housing is attached to the support fixture at the first end.

12. (Original) The device of claim 1, wherein the eyepiece assembly is disposed within a curved housing.

13. (Previously Presented) A compact display device for transmitting an image to a user's eye, the display device comprising:

a head-mountable support fixture comprising an elongated member having a first end and a second end;

a projection system including a display operative to provide an image, the support fixture attached at the first end to the projection system; and

Application No. 09/589,299

Filed: June 7, 2000

TC Art Unit: 2675

Confirmation No.: 9186

an eyepiece assembly attached to the second end of the support fixture, wherein the eyepiece assembly is disposed within a hollow, transparent, spherical curved optical and structural housing;

wherein the support fixture maintains the projection system and the eyepiece assembly in alignment along an optical path through free space between the projection system and the eyepiece assembly, with the projection system disposed to transmit the image on the optical path and the eyepiece assembly disposed to receive the image from the projection system and to direct the image to the user's eye.

14. (Original) The device of claim 13, wherein the eyepiece assembly further comprises a polarization beam-splitter coating, a quarterwave plate, and a focusing mirror disposed with the curved housing arranged so that polarized light from the projection system passes the beam-splitter coating and the quarterwave plate and is reflected from the focusing mirror to pass in the opposite direction through the quarterwave plate and is reflected from the beam-splitter coating toward the user's eye.

15. (Original) The device of claim 14, wherein a further lens is disposed within the curved housing.

16. (Previously Presented) The device of claim 13, wherein the eyepiece assembly further comprises a lens having an outer surface forming a part of the curved housing and an inner surface, the curvatures of the outer surface and the inner surface selected to provide a desired degree of magnification or aberration correction of light on the optical path.

17. (Original) The device of claim 13, wherein the curved housing includes an internal surface having a curvature selected to form a lens.

18. (Original) The device of claim 17, wherein the lens is a meniscus lens.

19. (Original) The device of claim 13, wherein the curved housing transmits ambient light.

Application No. 09/589,299

Filed: June 7, 2000

TC Art Unit: 2675

Confirmation No.: 9186

20. (Original) The device of claim 13, wherein the curved housing is coated with a scratch resistant coating or an antireflection coating.

21. (Currently Amended) A compact display device for transmitting an image to a user's eye, the display device comprising:

a head-mountable support fixture comprising an elongated member having a first end and a second end;

a projection system including a display operative to provide an image, the support fixture attached at the first end to the projection system; and

an eyepiece assembly attached to the second end of the support fixture;

wherein the support fixture maintains the projection system and the eyepiece assembly in alignment along an optical path through free space between the projection system and the eyepiece assembly, with the projection system disposed to transmit the image on the optical path and the eyepiece assembly disposed to receive the image from the projection system and to direct the image to the user's eye; and

wherein the eyepiece assembly comprises a non-axial optical system including a modified Mangin mirror comprising a solid optical material having an external entrance and exit surface and an internal reflective surface, the material arranged and having an index of refraction selected so that light from the projection system incident on the external surface is refracted as the light propagates into the material and light within the material is reflected off the internal reflective surface and is refracted at the external surface as the light exits the material, whereby off-axis aberrations are reduced.

22. (Original) The device of claim 21, wherein the reflective surface comprises a metal, a vacuum-deposited dielectric coating, or a holographic coating.

23. (Original) The device of claim 21, wherein the reflective surface is spherical or aspherical.

Application No. 09/589,299

Filed: June 7, 2000

TC Art Unit: 2675

Confirmation No.: 9186

24. (Original) The device of claim 21, wherein the reflective surface is a paraboloid.
25. (Original) The device of claim 21, wherein the reflective surface is partially transmitting and the eyepiece assembly further includes a section adjacent the reflective surface selected to reduce refraction of ambient light passing through the reflective surface into the solid optical material.
26. (Original) The device of claim 21, wherein the solid optical material is housed within a curved housing.
27. (Original) The device of claim 21, wherein the solid optical material is housed within a spherical housing.
28. (Previously Presented) The device of claims 1, 13, or 21, further comprising a housing, the projection system disposed within the housing, circuits and wiring in electrical communication with the projection system disposed within the housing, and the support fixture attached to the housing.
29. (Original) The device of claim 28, further comprising a mounting device configured to mount the housing to spectacle frames or a headband.
30. (Original) The device of claim 28, further including a microphone supported by the housing.
31. (Original) The device of claim 30, wherein the microphone is mounted on a boom.
32. (Original) The device of claim 28, further including an earpiece supported by the housing and operative to transmit audio output signals.

Application No. 09/589,299

Filed: June 7, 2000

TC Art Unit: 2675

Confirmation No.: 9186

33. (Original) The device of claim 28, further comprising a boom attached to a headband, the housing attached to the boom.
34. (Original) The device of claim 33, further comprising a microphone supported by the headband.
35. (Original) The device of claim 33, further comprising an earpiece supported by the headband and operative to transmit audio output signals.
36. (Original) A cellular telephone in communication with the display device of claim 1.
37. (Original) A computer in communication with the display device of claim 1.
38. (Original) A personal digital assistant in communication with the display device of claim 1.
39. (Previously Presented) A cellular telephone in communication with the display device of claim 13.
40. (Previously Presented) A computer in communication with the display device of claim 13.
41. (Previously Presented) A personal digital assistant in communication with the display device of claim 13.
42. (Previously Presented) A cellular telephone in communication with the display device of claim 21.
43. (Previously Presented) A computer in communication with the display device of claim 21.

Application No. 09/589,299

Filed: June 7, 2000

TC Art Unit: 2675

Confirmation No.: 9186

44. (Previously Presented) A personal digital assistant in communication with the display device of claim 21.